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CLEANING MATERIALS

Applicant:	000229542 Japan Vilene Co., Ltd. 2-14-5, Soto-kanda, Chiyoda-ku Tokyo

Inventors:

Toshiaki Takase
Japan Vilene Co., Ltd.
7, Kitatone, Sowa-cho
Sarushima-gun,
Ibaraki-ken

Noboru Tanaka
Japan Vilene Co., Ltd.
7, Kitatone, Sowa-cho
Sarushima-gun,
Ibaraki-ken

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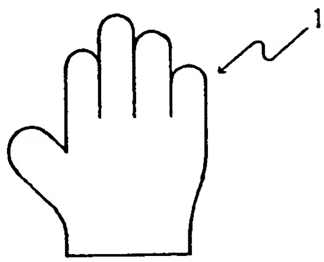
Abstract

Objective

To provide cleaning materials that do not damage the materials that were cleaned, that can clean without charging with static electricity, and that are excellent in durability and workability.

Constitution

The cleaning materials of the present invention use fiber sheets containing electrically conductive fibers coated with conjugate polymers, with the cleaning materials being in glove-shaped form.



Claims

1. Cleaning materials, characterized by the use of fiber sheets containing electrically conductive fibers coated with conjugate polymers, with the cleaning materials being in glove-shaped forms.

2. Cleaning materials according to Claim 1, characterized in that the fine-fibers formed from fine-fiber-forming conjugate fibers are electrically conductive fibers coated with conjugate polymers.

3. Cleaning materials according to Claim 2, characterized in that the fine-fibers formed from fine-fiber-forming conjugate fibers have different cross-sectional shapes.

4. Cleaning materials according to any of Claims 1-3, characterized in that the fiber sheets are nonwoven fabrics obtained using the fluid interlacing method.

5. Cleaning materials according to Claim 4, characterized in that the nonwoven fabrics obtained using the fluid-interlacing-method are partially melt-bonded.

Detailed explanation of the invention

[0001]

Industrial application field

The present invention pertains to cleaning materials that are suitable for cleaning those materials that easily generate static electricity caused by friction; for example, in cleaning prepainted automobiles, wood products, polymer products, furniture items such as tables, desks, chests of drawers, cabinets, and chairs, as well as windows, doors, floors, etc.

[0002]

Prior art

When an automobile is repaired, then painted, if the area to be painted is adhered with dust, the finishing of the painting is poor; therefore before painting it is necessary to clean the area to be painted. When a cleaning material made of a common fabric or nonwoven fabric was used, the area to be painted could be temporarily cleaned, but static electricity was generated by the friction of the cleaning material with the area to be painted, so dust easily adhered on the area to be painted, making it impractical. Therefore, an ion neutralizer and a cloth having a certain surface viscosity are generally used together for cleaning. However, in this method after electricity is removed by the ion neutralizer, it is cleaned with the cloth having surface viscosity, making it complicated; moreover, the ion neutralizer

is large and heavy so it cannot be used in narrow spaces and in high places, thus the working site is limited.

[0003]

On the other hand, when a cleaning material made of a common fabric or a nonwoven fabric was used to clean furniture, windows, doors, or floors, they could only temporarily be cleaned because static electricity was generated by the friction of the cleaning materials and the materials that were cleaned, so there was a problem of easy adhesion of dust on the materials that were cleaned. Therefore, cleaning materials prepared by mixing electrically conductive fibers with carbon black and a metal powder or metal-plated electrically conductive fibers were used, but the fiber strength of the former is weak and its durability is poor, whereas the latter damages the materials to be cleaned.

[0004]

Problems to be solved by the invention

The present invention was conducted to solve the above-mentioned problems and its objective is to provide cleaning materials that (1) do not damage the materials that were cleaned, (2) can clean without charging with static electricity, and (3) are excellent in durability and workability.

[0005]

Means to solve the problems

The cleaning materials of the present invention use fiber sheets containing electrically conductive fibers coated with conjugate polymers, produced in a glove-shaped form.

[0006]

Function

The cleaning materials of the present invention use electrically conductive fibers coated with conjugate polymers. The conjugate polymers are soft so they do not damage the materials that are cleaned; moreover, when they clean, they remove static electricity by corona discharge, so the materials that were cleaned are not charged with static electricity. Furthermore, conjugate polymers coat only the surface of the fibers and do not deteriorate the strength of the fibers, so they have excellent durability in cleaning various materials. Moreover, the cleaning materials of the present invention can clean and remove static electricity by wiping only; in addition, they are in a bag-shaped form, so the hands, mops, legs, etc., can be inserted into the bag-shaped space, making cleaning easy, and they are excellent in workability.

[0007]

The cleaning materials of the present invention contain electrically conductive fibers coated with conjugate polymers.

Examples of fibers that can be coated with conjugate polymers include natural fibers such as silk, cotton, hemp, etc.; regenerated fibers such as rayon fibers; semisynthesized fibers such as acetate fibers; and synthetic fibers such as polyamide fibers, poly(vinyl alcohol) fibers, acrylic fibers, polyester fibers, poly(vinylidene chloride) fibers, poly(vinyl chloride) fibers, polyurethane fibers, polyethylene fibers, polypropylene fibers, aromatic polyamide fibers, etc. Conjugate fibers such as the side-by-side type and core-sheath type made of at least two polymers can also be used.

[0008]

Fine-fiber-forming conjugate fibers (herein referred to as "fine-fiber-forming fibers") that can form fine fibers with a fineness of 0.5 denier or less by mechanical and/or chemical treatment are not only excellent in removing static electricity by corona discharge, as well as excellent in cleanability, retention of dust, and imparting less damage to materials that were cleaned, but also are excellent in strength. Therefore, fine-fiber-forming fibers can be suitably used. Examples of the fine-fiber-forming fibers include island-type fibers that have the cross-sectional view shown in Figure 1, in which several components B are arranged inside another component A; multiple bimetal-type fibers that have the cross-sectional view shown in Figure 2, in which one component A and another component B are alternately laminated; and chrysanthemum-type fibers that have the cross-sectional view shown in Figures 3 (a) and (b), in which component A is divided by another component B, which radiates from the center of the fiber to the surface of the fiber. Among these fibers, those that are formed from the multiple bimetal-

type fibers or the chrysanthemum-type fibers have a cross-sectional view of roughly a trapezoid shape or fan shape and have a better cleanability, so they are preferably used.

[0009]

The fine-fiber-forming conjugate fibers are composed of at least two components. Examples of the combination of two components include a polyamide and polyester, polyamide and polyolefin, polyester and polyolefin, polyester and polyacrylonitrile, polyolefin and polyacrylonitrile, etc.

[0010]

The amount of fine-fibers formed from the fine-fiber-forming fibers in cleaning materials is preferably 5 wt% or greater; the higher the amount, the more efficient the corona discharge, and the better the removal of static electricity, so it is more preferably 50 wt% or greater and most preferably 90 wt% or greater.

[0011]

The above-mentioned fibers are coated with conjugate polymers to form electrically conductive fibers. However, if they are coated in the fiber state, followed by forming fiber sheets, there is a possibility of damaging the polymers at the time of forming said fiber sheets, so it is better to form a fiber sheet, then coat with the conjugate polymers to form electrically conductive fibers. In this case, it is possible that electrically conductive fibers are formed, in which the fibers are not

completely coated with the conjugate polymers. In the following, the formation of cleaning materials by forming fiber sheets, followed by coating with conjugate polymers, will be explained.

[0012]

Examples of fiber sheets that form the cleaning materials of the present invention include nonwoven fabrics, fabrics, knitted goods, etc. Above all, for nonwoven fabrics, by orienting the fibers in the thickness direction, the fiber edges, which can participate in removing static electricity by corona discharge, can be increased in length; moreover, they have three-dimensional forms, so the dust that was wiped can be retained, making them useful. Nonwoven fabrics in which the orientation of the fibers is in the of thickness direction can be obtained by interlacing the fiber webs obtained using a dry method such as the carding process and aeration process, a wet method, a direct method such as the melt process and spun-bonding process with a liquid such as water, or a mechanical method such as using needles. If a fluid is used for interlacing, more uniform, stronger, and soft nonwoven fabrics can be obtained, making it more suitable. When the carding process is used to form fiber webs, if cross-laid fiber webs are contained in the lengthwise direction of the fiber webs, the strength in the width direction of the fiber webs can be improved, so cleaning can be conducted without directionality, making it a more preferable orientation.

[0013]

To improve the strength and abrasion resistance of nonwoven fabrics, they can be melt-bonded with nonwoven fabric-forming

fibers or binders such as an emulsion, solvent, or powders. However, in order to not reduce the static-electricity-removing property, it is preferably to fix it partially. When fixing it partially, to prevent reduction of the static-electricity-removing property, it is preferable that each fixation area is 0.01-5.0 mm^2 and that the total fixation area is 5-50% of the total area of the nonwoven fabric. Among these methods, if partial melt-bonding of nonwoven fabric-forming fibers with embossing rollers or ultrasound waves is carried out, no falling off of materials occurs when using a cleaning material such as when a binder is used, so it has an excellent cleaning property, making it a better method.

[0014]

If a liquid or mechanical method such as that using needles is applied to fiber webs containing fine-fiber-forming fibers of the above-mentioned multiple bimetal-type fibers or chrysanthemum-type fibers, fine fibers can be obtained. At the same time, the fine fibers can be interlaced, so it is a reasonable nonwoven fabric-forming method that does not need a separate process for forming fine fibers. Furthermore, by interlacing fine fibers a compact structure can be obtained, giving it the strong point of an excellent retention of dust.

[0015]

The thus obtained fiber sheets of nonwoven fabrics are porous, so roughly the whole fiber sheets can be coated with conjugate polymers. The conjugate polymers can be adhered tightly to the fibers, so they are excellent in durability and softness,

and they can remove static electricity without damaging the materials that were cleaned.

[0016]

In the present invention, it is preferable that the surface resistivity of fiber sheets containing fibers coated with conjugate polymers is 1×10^9 Ω/□ or less. If the surface resistivity is greater than 1×10^9 Ω/□, the ability to remove static electricity is remarkably reduced, so more preferably it is 1×10^6 Ω/□ or less and most preferably 1×10^4 Ω/□ or less.

[0017]

One method for coating with conjugate polymers is that of impregnating fiber sheets in solutions containing oxidizing agents such as iron (III) chloride and copper (II) chloride, followed by contacting with monomers to carry out polymerization. For contacting monomers, first, when the monomers are liquid, fiber sheets adhered with oxidizing agents are impregnated, coated, or sprayed with the monomers and second, when the monomers are gases, fiber sheets adhered with oxidizing agents are placed in vessels filled with the monomers.

[0018]

Examples of monomers that form the conjugate polymers include acetylene, benzene, aniline, phenylacetylene, pyrrole, furan, thiophene, indole, and derivatives of these monomers. Above all, pyrrole is excellent in electrical conductivity and

polymerizability, static-electricity-removing property, and durability, so pyrrole is especially suitable for use.

[0019]

If the whole fiber sheet is coated with a conjugate polymer, the static-electricity-removing property will be much better. However, only a portion of the fiber sheet can be coated as well.

[0020]

If the thus obtained electrically conductive fiber sheet is used to produce a bag-shaped form, a cleaning material that can clean an object easily with an excellent workability can be obtained. The bag-shaped form can be like that shown in Figure 4, a glove-shaped form into which five fingers can be separately inserted; a mitten-shaped form, like that shown in Figure 5, in which the thumb is separated from the other four fingers; a hemisphere-shaped glove into which the whole arm can be inserted; or as shown in Figure 6, an article made by integrating a glove with an electrically conductive fiber sheet. In addition, it can be a form into which an arm can be inserted, and it can also be a form into which a mop or foot can be inserted.

[0021]

In order to form the cleaning material of the present invention into a glove, an electrically conductive sheet is used on at least one side of the cleaning material; if the surface of the electrically conductive fiber sheet makes contact with a material to be cleaned, the material can be cleaned without

charging with electricity. More preferably, the electrically conductive fiber sheet is used on both sides of the cleaning material so that both sides can be used for cleaning, thereby the cleaning material can be used for a long time.

[0022]

The bag-shaped form can be produced by sewing an electrically conductive fiber sheet or utilizing the melt-bonding of fibers that formed the electrically conductive fiber sheets. In the former case, if electrically conductive yarns are used, the static-electricity-removing property will be better. After a bag-shaped form is produced using a fiber sheet, it can be coated with a conjugate polymer to impart electrical conductivity.

[0023]

The cleaning materials of the present invention do not damage the objects that were cleaned. Moreover, they are excellent in cleanability and in the static-electric-removing property, so they are suitable for cleaning prepainted automobiles, wood products, polymer products, furniture items such as tables, desks, chests of drawers and, cabinets, as well as doors, floors, etc., which can easily generate static electricity by friction.

[0024]

In the following, the present invention will be explained using application examples, but it is not limited to these

examples. The surface resistivity was measured using the Roresta AP MCP-T400 (Mitsubishi Petrochemical Co., Ltd.).

[0025]

Application examples

Application Example 1

A fine-fiber-forming substance(fineness 2 denier, fiber length 38 mm)(which can form 0.175-denier fine fibers made of polyester and 0.075-denier fine fibers made of polyamide) with a chrysanthemum-like cross section obtained by dividing polyester (A) into eight sections by polyamide (B) radiating from the center of the fiber to the surface of the fiber, as shown in Figure 3(a), was carded to obtain a unidirectional fiber web. the unidirectional fiber web was laminated with a cross-laid fiber web in a 1:4 weight ratio to obtain a laminated fiber web. Water was jetted with a pressure of 95 kg/cm^2 from a nozzle plate with a diameter of 0.15 mm and a pitch of 0.6 mm to interlace the laminated fiber web to obtain a nonwoven fabric with a basis weight of 85 g/m^2 and thickness of 0.4 mm. The nonwoven fabric was impregnated in a 30% concentration iron (III) chloride solution, then made to contact pyrrole gas obtained by evaporating a pyrrole solution to carry out polymerization. In this way, the whole surface of the nonwoven fabric was coated with polypyrrole to obtain an electrically conductive nonwoven fabric with a surface resistivity of 200 Ω/□. The electrically conductive fabric was sewed with a sewing machine to obtain a glove-shaped cleaning material as shown in Figure 4.

[0026]

Application Example 2

A nonwoven fabric (basis weight of 85 g/m^2 and thickness of 0.8 mm) was prepared using the method of Application Example 1, except that the polyester fibers (with a circular cross section, fineness of 1.5 denier, and fiber length of 38 mm) were used. As in Application Example 1, the whole surface of the nonwoven fabric was then coated with a polypyrrole to obtain an electrically conductive nonwoven fabric with surface resistivity of 4.1×10^2 Ω/□. The electrically conductive nonwoven fabric was then sewed with a sewing machine to obtain a glove-shaped cleaning material as shown in Figure 4.

[0027]

Application Example 3

A nonwoven fabric was prepared as in Application Example 1. The nonwoven fabric was then passed through an embossing roller at 185°C and a linear pressure of 60 kg/cm (projection area 0.25 mm^2, projection area at the embossing roller of 16%) for partial melt-bonding to obtain a melt-bonded nonwoven fabric with a basis weight of 85 g/m^2, and thickness 0.4 mm at the non-melt-bonded region. Next, as in Application Example 1, the whole surface of the melt-bonded nonwoven fabric was coated with polypyrrole to obtain an electrically conductive nonwoven fabric with a surface resistivity of 200 Ω/□. The electrically conductive nonwoven fabric was then sewed with a sewing machine to obtain a glove-shaped cleaning material shown in Figure 4.

[0028]

Comparative example

A nonwoven fabric (surface resistivity: 6.8 x 10^{12} Ω/□) of Application Example 1 was sewed using a sewing machine to make a glove-shaped cleaning material shown in Figure 4.

[0029]

Test for static-electricity-removing property

The electrically conductive nonwoven fabrics of Application Examples 1-3 and the nonwoven fabric of the comparative example were used to wipe polyimide films back and forth five times, then the electrostatic charge was measured using a friction-induced electrostatic charge tester (EST-7, Kanebo Engineering Co., Ltd.) the JIS Standards L 1092 method. The measurements were conducted under the conditions of 20°C and relative humidity of 50%. The results are shown in Figure 1.

[0030]

Table I

摩擦回数	帯電圧 (KV)			耐磨耗性* (級)	
	0	20	23万	20	23万
実施例1	0.3	0.3	0.2	N	H
実施例2	1.5	1.4	1.2	N	H
実施例3	0.5	0.5	0.4	N	N
比較例	8.0	8.0	7.6	N	H

#: Order of excellence in abrasion resistance is H < M < L < N

Key:
1 Level of friction
2 Electrostatic charge
3 Abrasion resistance#
4 Application example
5 Comparative example
6 230,000

[0031]

Test for abrasion resistance

The test for abrasion resistance of the electrically conductive nonwoven fabrics of Application Examples 1-3 and the nonwoven fabric of the comparative example was carried out using the C method (Appearance Retention Tester) of JIS L 1076 and a load of 20 g/cm^2; friction was generated 20 and 230,000 times. The abrasion resistance was visually evaluated; at the same time, the static-electricity-removing property of the cleaning materials after the test for abrasion resistance was tested as it was done earlier. The results are shown in Table I. The cleaning

materials of the present invention are excellent in abrasion resistance and, even if they are abraded until forming pillings, they are excellent with regard to the static-electricity-removing property, so they are excellent in durability.

[0032]

Effect of the invention

The cleaning materials of the present invention use fiber sheets containing electrically conductive fibers coated with conjugate polymers, so they do not damage the materials that were cleaned. They can clean and remove static-electricity and are excellent in durability. Moreover, the cleaning materials of the present invention can clean and remove static-electricity simply by wiping and have bag-shaped forms, so they are excellent in workability.

Brief description of the figures

Figure 1 shows an example of a cross-sectional view of a fine-fiber-forming conjugate fiber of the present invention.

Figure 2 shows another example of the cross-sectional view of a fine-fiber-forming conjugate fiber of the present invention.

Figure 3(a) shows another example of the cross-sectional view of a fine-fiber-forming conjugate fiber of the present invention.

Figure 3(b) shows another example of the cross-sectional view of a fine-fiber-forming conjugate fiber of the present invention.

Figure 4 shows an example of the front view of the cleaning materials of the present invention.

Figure 5 shows another example of the front view of the cleaning materials of the present invention.

Figure 6 shows another example of the front view of the cleaning materials of the present invention.

Explanation of symbols

A: One component, B: Another component, 1: Cleaning material.

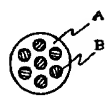


Figure 1

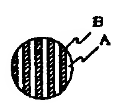


Figure 2

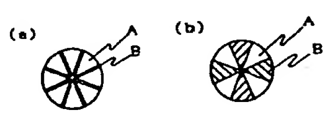


Figure 3

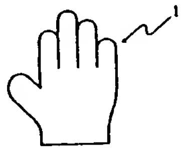


Figure 4

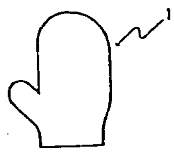


Figure 5

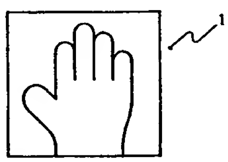


Figure 6